CLAIMS:

What is claimed is:

5   1.   A method, in a data processing system, for determining configuration parameter value settings for a computing device to optimize an operational characteristic of the computing device, comprising:

obtaining a simplex of points, wherein each point in the simplex represents a set of configuration parameters for the computing device;

10   performing a geometric transformation on the simplex of points to identify a new point to investigate;

sampling the operational characteristic at the new point;

determining if the operational characteristic associated with the new point is worse than a value of the operational characteristic for each point in the simplex of

15   points;

determining a set of points in the simplex that need to be resampled if the new point is worse than a value of the operational characteristic for each point int he simplex of points;

resampling the operational characteristic at each of the points in the set of points;

20   and

determining a new simplex based on the resampled operational characteristic of points in the set of points.

2.   The method of claim 1, wherein the set of points comprises a best point in the

25   simplex of points, and wherein determining a new simplex based on the resampled operational characteristic of points in the set of points includes determining whether to

expand or contract the simplex based on the resampling of the operational characteristic at the best point in the simplex of points to obtain the new simplex.

3.   The method of claim 1, further comprising:

extending the simplex in a direction of the new point if the operational characteristic of the new point is better than values of the operational characteristic for each point in the simplex of points.

4.   The method of claim 1, further comprising:

assigning an upper threshold and a lower threshold to a size of the simplex; and

limiting expansion or contraction of the simplex based on the assigned upper and lower thresholds.

5.   The method of claim 4, wherein the lower threshold on the size of the simplex represents a lowest resolution of significance for each of the parameters of the simplex.

6.   The method of claim 4, wherein if one or more of the configuration parameter values associated with the new point violates one of the upper threshold and lower threshold, the new point is mapped to a point closest to the new point whose associated configuration parameter values satisfy the upper threshold or lower threshold.

7.   The method of claim 2, wherein determining whether to expand or contract the simplex based on the resampling of the operational characteristic at the best point in the simplex of points includes:

comparing a resampled operational characteristic value for the best point to a previous operational characteristic value for the best point; and

determining whether to expand or contract the simplex based on a difference between the resampled operational characteristic value and the previous operational characteristic value.

5   8.   The method of claim 7, wherein if the difference is greater than a threshold, the simplex is expanded.

9.   The method of claim 7, wherein if the difference is not greater than a threshold, then the simplex is contracted.

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10.   The method of claim 1, wherein configuration parameter values for points in the simplex may include both real and integer configuration parameter values.

11.   The method of claim 10, further comprising:

15   checking the dimensionality of the modified simplex obtained by expanding or contracting the simplex; and

not performing the expansion or contraction if the modified simplex would have a different dimensionality from the simplex.

20   12.   The method of claim 1, further comprising:

converting configuration parameter values of the new point to one of integer and real values based on a value type for the configuration parameters;

checking the converted configuration parameter values to determine if a dimensionality of the simplex is changed by the conversion of the configuration

25   parameters; and

setting the converted configuration parameter values of the new point that result in

Docket No. YOR920030042US1

a change in the dimensionality of the simplex to converted configuration parameter values that do not reduce the dimensionality of the simplex.

13. The method of claim 12, wherein setting the converted configuration parameter values of the new point that result in a change in the dimensionality of the simplex to converted configuration parameter values that do not reduce the dimensionality of the simplex includes:

setting the converted configuration parameter values to converted configuration parameter values that equal the converted configuration parameter values minus a penalty value.

14. The method of claim 13, wherein the penalty value is a quadratic function of a distance between an original configuration parameter value of the new point and the converted configuration parameter value.

15. The method of claim 1, further comprising:

using configuration parameter values of the best point in the simplex to configure the computing device if no improvement of the simplex is obtainable.

16. A computer program product in a computer readable medium for determining configuration parameter value settings for a computing device to optimize an operational characteristic of the computing device, comprising:

first instructions for obtaining a simplex of points, wherein each point in the simplex represents a set of configuration parameters for the computing device;

second instructions for performing a geometric transformation on the simplex of points to identify a new point to investigate;

Docket No. YOR920030042US1

third instructions for sampling the operational characteristic at the new point;

fourth instructions for determining if the operational characteristic associated with the new point is worse than a value of the operational characteristic for each point in the simplex of points;

5   fifth instructions for determining a set of points in the simplex that need to be resampled if the new point is worse than a value of the operational characteristic for each point int he simplex of points;

sixth instructions for resampling the operational characteristic at each of the points in the set of points; and

10   seventh instructions for determining a new simplex based on the resampled operational characteristic of points in the set of points.

17.   The computer program product of claim 16, wherein the set of points comprises a best point in the simplex of points, and wherein the seventh instructions for determining a

15   new simplex based on the resampled operational characteristic of points in the set of points include instructions for determining whether to expand or contract the simplex based on the resampling of the operational characteristic at the best point in the simplex of points to obtain the new simplex.

20 18.   The computer program product of claim 16, further comprising:

eighth instructions for extending the simplex in a direction of the new point if the operational characteristic of the new point is better than values of the operational characteristic for each point in the simplex of points.

25 19.   The computer program product of claim 16, further comprising:

eighth instructions for assigning an upper threshold and a lower threshold to a size

Docket No. YOR920030042US1

of the simplex; and

ninth instructions for limiting expansion or contraction of the simplex based on the assigned upper and lower thresholds.

5   20.   The computer program product of claim 19, wherein the lower threshold on the size of the simplex represents a lowest resolution of significance for each of the parameters of the simplex.

21.   The computer program product of claim 19, wherein if one or more of the
10   configuration parameter values associated with the new point violates one of the upper threshold and lower threshold, the new point is mapped to a point closest to the new point whose associated configuration parameter values satisfy the upper threshold or lower threshold.

15   22.   The computer program product of claim 17, wherein the instructions for determining whether to expand or contract the simplex based on the resampling of the operational characteristic at the best point in the simplex of points include:

instructions for comparing a resampled operational characteristic value for the best point to a previous operational characteristic value for the best point; and
20   instructions for determining whether to expand or contract the simplex based on a difference between the resampled operational characteristic value and the previous operational characteristic value.

23.   The computer program product of claim 22, wherein if the difference is greater
25   than a threshold, the simplex is expanded.

Docket No. YOR920030042US1

46

24.   The computer program product of claim 22, wherein if the difference is not greater than a threshold, then the simplex is contracted.

25.   The computer program product of claim 16, wherein configuration parameter
5   values for points in the simplex may include both real and integer configuration parameter values.

26.   The computer program product of claim 25, further comprising:

eighth instructions for checking the dimensionality of the modified simplex
10   obtained by expanding or contracting the simplex; and

ninth instructions for not performing the expansion or contraction if the modified simplex would have a different dimensionality from the simplex.

27.   The computer program product of claim 16, further comprising:

15   eighth instructions for converting configuration parameter values of the new point to one of integer and real values based on a value type for the configuration parameters;

ninth instructions for checking the converted configuration parameter values to determine if a dimensionality of the simplex is changed by the conversion of the configuration parameters; and

20   tenth instructions for setting the converted configuration parameter values of the new point that result in a change in the dimensionality of the simplex to converted configuration parameter values that do not reduce the dimensionality of the simplex.

28.   The computer program product of claim 27, wherein the tenth instructions for
25   setting the converted configuration parameter values of the new point that result in a change in the dimensionality of the simplex to converted configuration parameter values

that do not reduce the dimensionality of the simplex include:

instructions for setting the converted configuration parameter values to converted configuration parameter values that equal the converted configuration parameter values minus a penalty value.

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29.   The computer program product of claim 28, wherein the penalty value is a quadratic function of a distance between an original configuration parameter value of the new point and the converted configuration parameter value.

10   30.   The computer program product of claim 16, further comprising:

eighth instructions for using configuration parameter values of the best point in the simplex to configure the computing device if no improvement of the simplex is obtainable.

15   31.   An apparatus for determining configuration parameter value settings for a computing device to optimize an operational characteristic of the computing device, comprising:

means for obtaining a simplex of points, wherein each point in the simplex represents a set of configuration parameters for the computing device;

20   means for performing a geometric transformation on the simplex of points to identify a new point to investigate;

means for sampling the operational characteristic at the new point;

means for determining if the operational characteristic associated with the new point is worse than a value of the operational characteristic for each point in the simplex

25   of points;

means for determining a set of points in the simplex that need to be resampled if

the new point is worse than a value of the operational characteristic for each point int he simplex of points;

      means for resampling the operational characteristic at each of the points in the set of points; and

5   means for determining a new simplex based on the resampled operational characteristic of points in the set of points.

32.   A method of configuring a computing device by optimizing configuration parameter value settings, comprising:

10   obtaining a simplex of points, wherein each point in the simplex represents a set of configuration parameters for the computing device, and wherein each point has a corresponding operational characteristic value associated with the point;

      performing one or more geometric transformations on the simplex based on the operational characteristic values associated with the points of the simplex to identify a

15 new points to investigate;

      measuring a value of the operational characteristic based on a set of configuration parameters associated with the new points; and

      configuring the computing device based on values of a set of configuration parameters associated with a best point in a resulting simplex, wherein performing the

20 one or more geometric transformations includes checking the new points obtained from performing the one or more geometric transformations to determined if one or more conditions are violated and wherein the conditions are set so as to compensate for dynamic and noisy operating environments of the computing device.

25 33.   The method of claim 32, wherein performing the one or more geometric transformations includes:

applying an upper and lower limit on a size of the simplex;

comparing new point configuration parameter values against the upper and lower limit; and

adjusting the new point configuration parameter values based on the comparison.

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34.   The method of claim 32, wherein performing the one or more geometric transformations includes:

permitting both real and integer valued configuration parameter values;

determining if new point configuration parameter values result in a reduction in

10   dimensionality of the simplex; and

adjusting the new point configuration parameter values based on the determination.

35.   The method of claim 32, wherein performing the one or more geometric

15   transformations includes:

· resampling the operational characteristic at a best point in the simplex if a geometric transformation does not result in a new point whose configuration parameter values result in a better operational characteristic value;

comparing a resampled operational characteristic value of the best point to an

20   original operational characteristic value of the best point; and

determining whether to expand or contract the simplex based on the comparison.